EP 2462 (5)

(12) UK Patent Application (19) GB (11) 2 344 189 (13) A

(43) Date of A Publication 31.05.2000

(21) Application No 9825863.5

(22) Date of Filing 26.11.1998

(51) INT CL[7]
F24J 2/12 // G02B 7/182

(52) UK CL (Edition R)
G2J JMF JMM

(56) Documents Cited
DE 019649988 A SU 001823040 A

(58) Field of Search
UK CL (Edition Q) G2J JMF JMM
INT CL[6] F24J , G02B
ONLINE: WPI, EPODOC, JAPIO

(71) Applicant(s)
Nikolai Ustinow
Freiheitstrasse 138, 15745 Wildau,
Federal Republic of Germany

(72) Inventor(s)
Nikolai Ustinow

(74) Agent and/or Address for Service
Marks & Clerk
57-60 Lincoln's Inn Fields, LONDON, WC2A 3LS,
United Kingdom

(54) Abstract Title
Inflatable solar mirror

(57) An inflatable solar mirror which contains springy rings 1 with a reflective, conical or rotation-parabolic surface. The rings are positioned so that rays impinging on the reflective surface are reflected in a pre-determined manner. The rings are mounted on an inflatable body 2 and can be assembled by means of winged nuts and press studs. The mirror can also include a collapsible air heating chambre 8 where the hot air drives a Ljungstrom turbine 9 so that electricity can be made. Also included is apparatus for pivotably mounting the mirror.

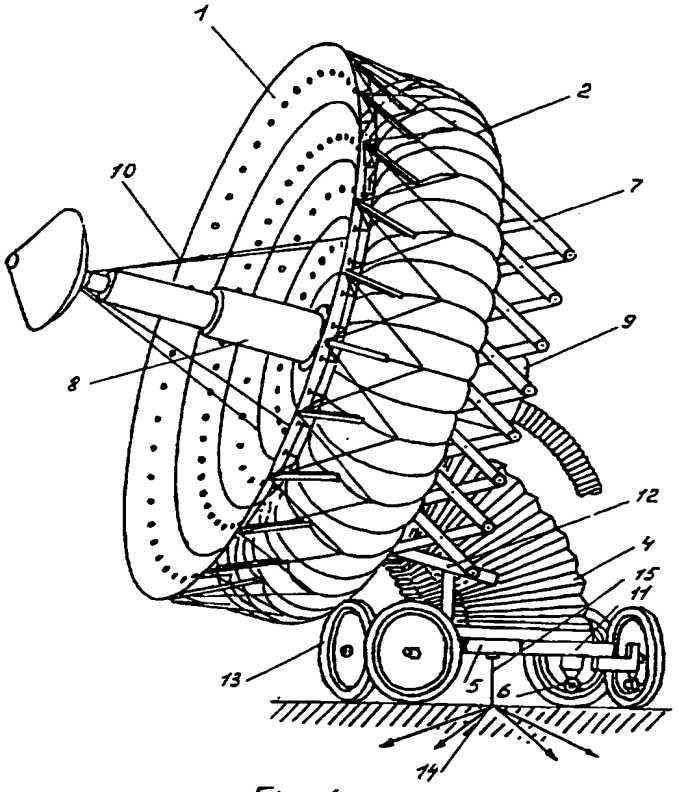

Fig. 1

GB 2 344 189 A

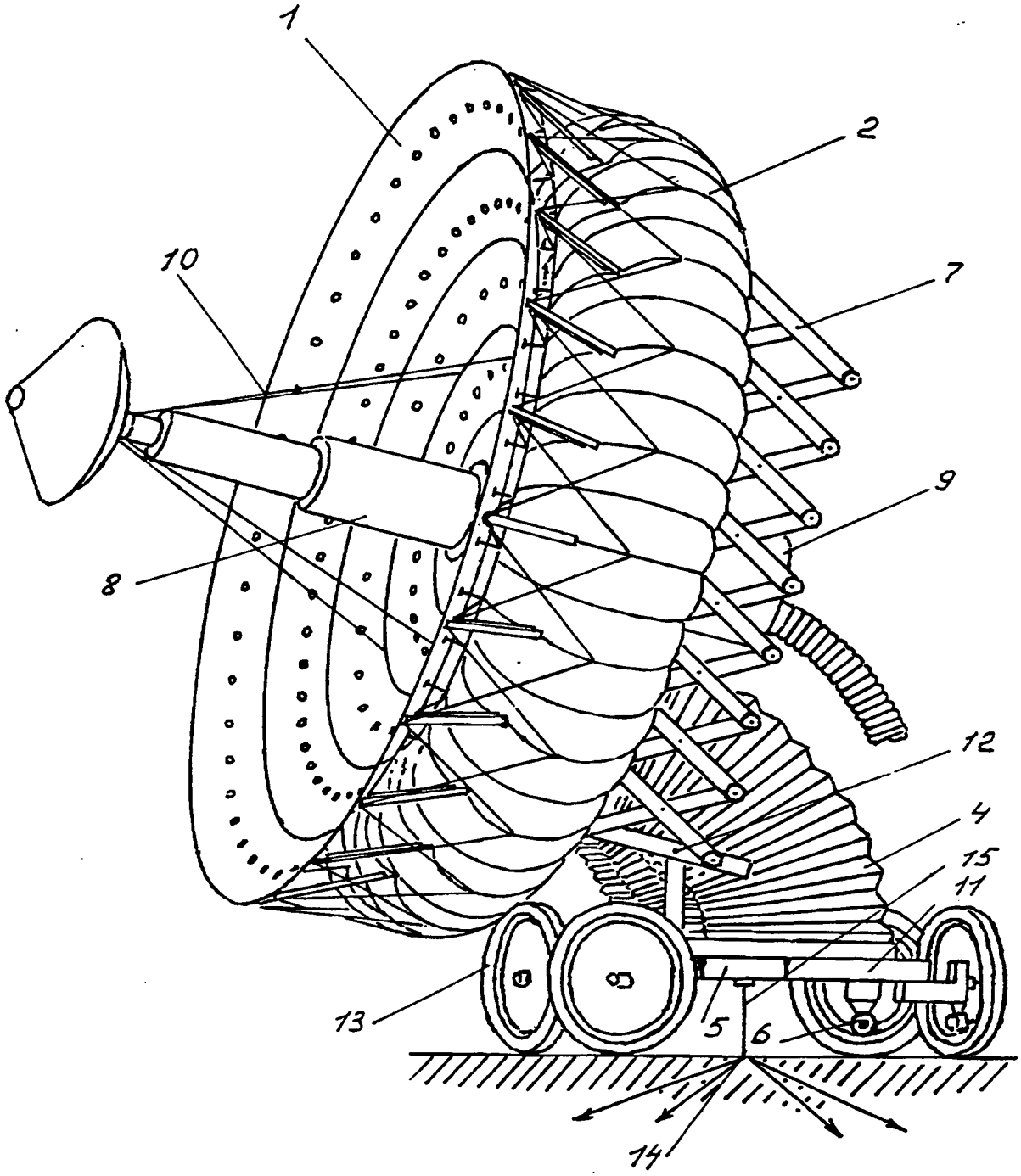

Fig. 1

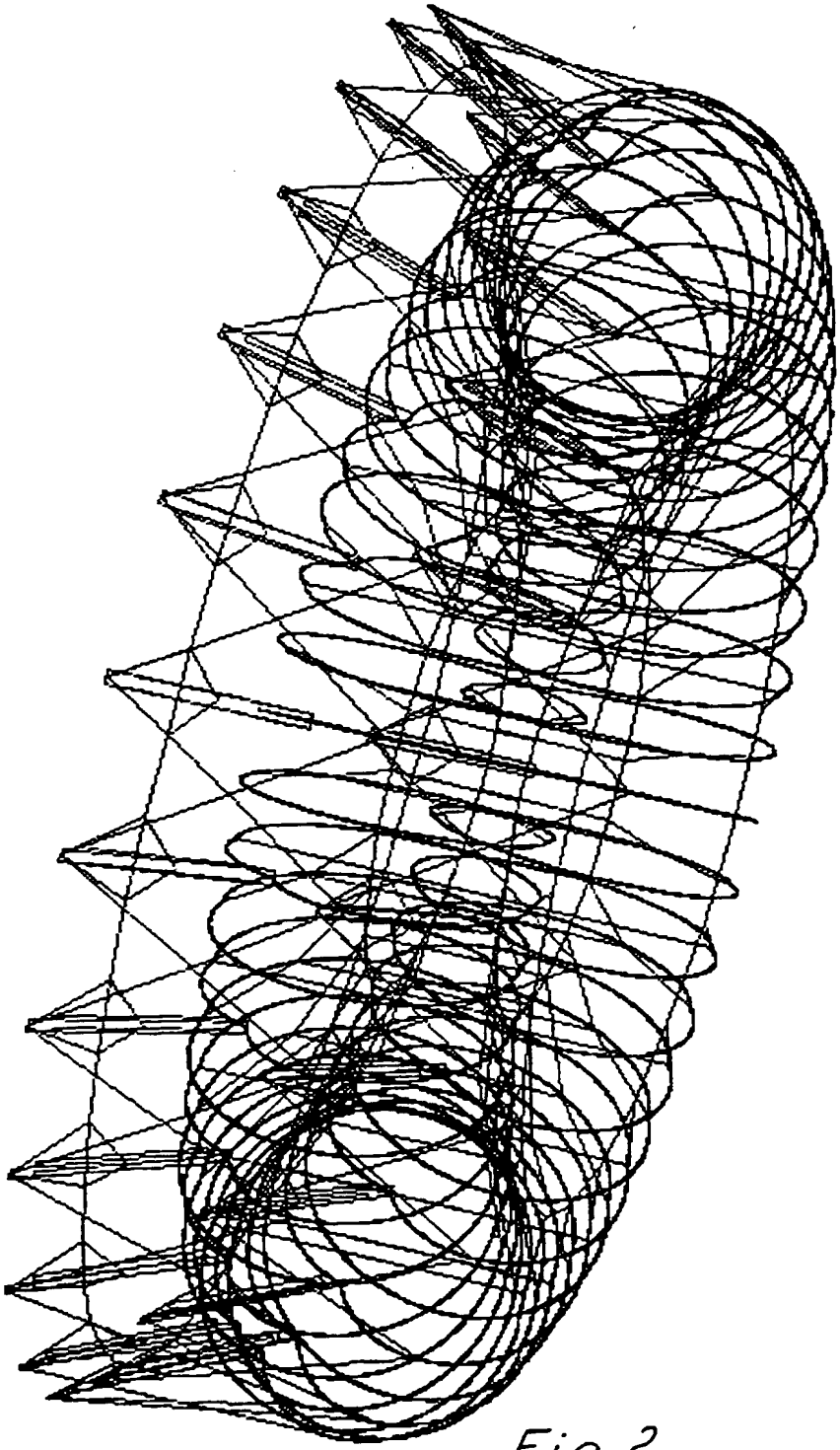

Fig. 2.

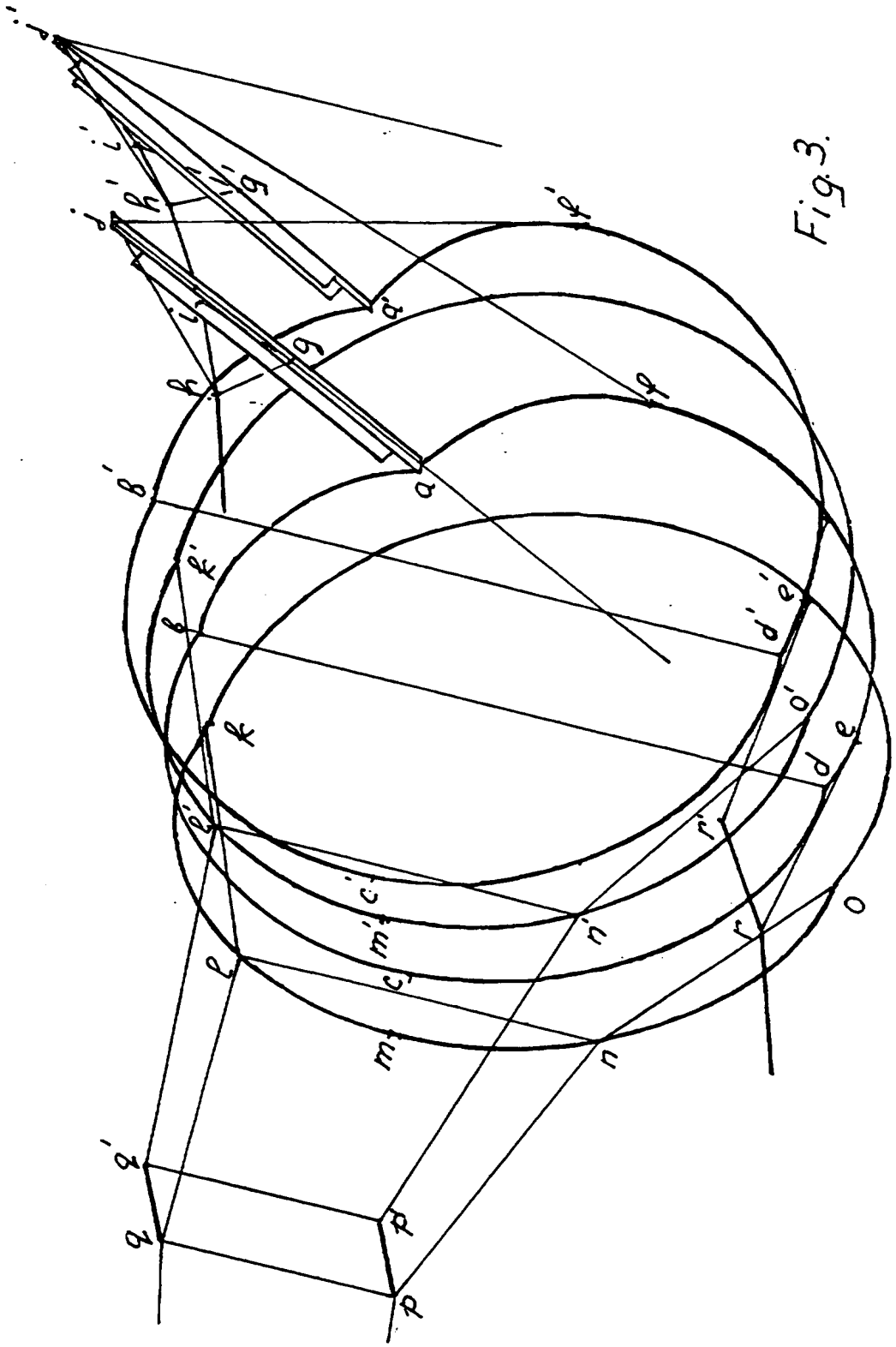

Fig.3.

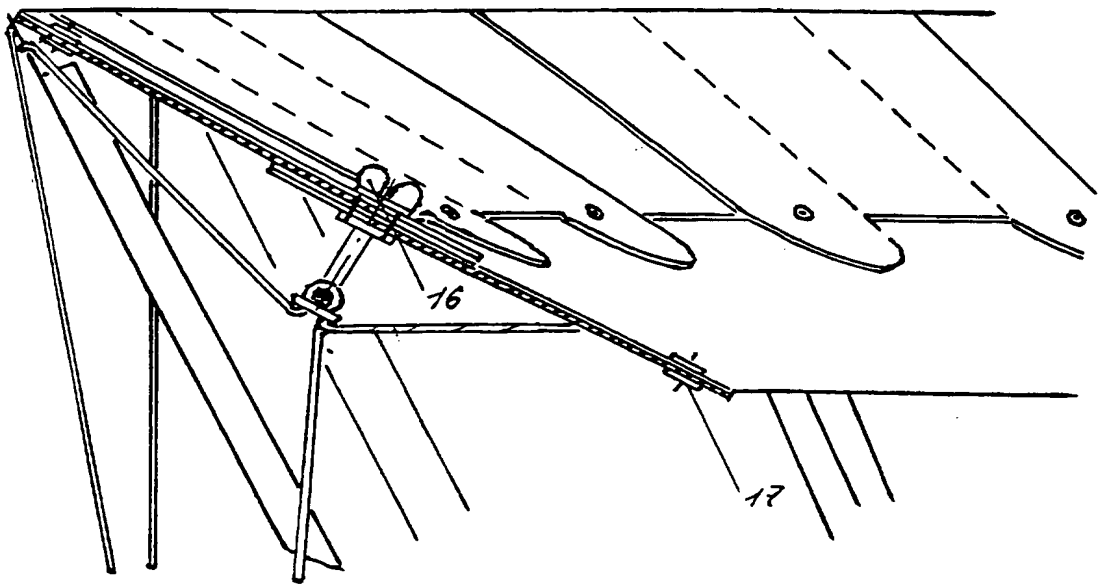

Fig.4.

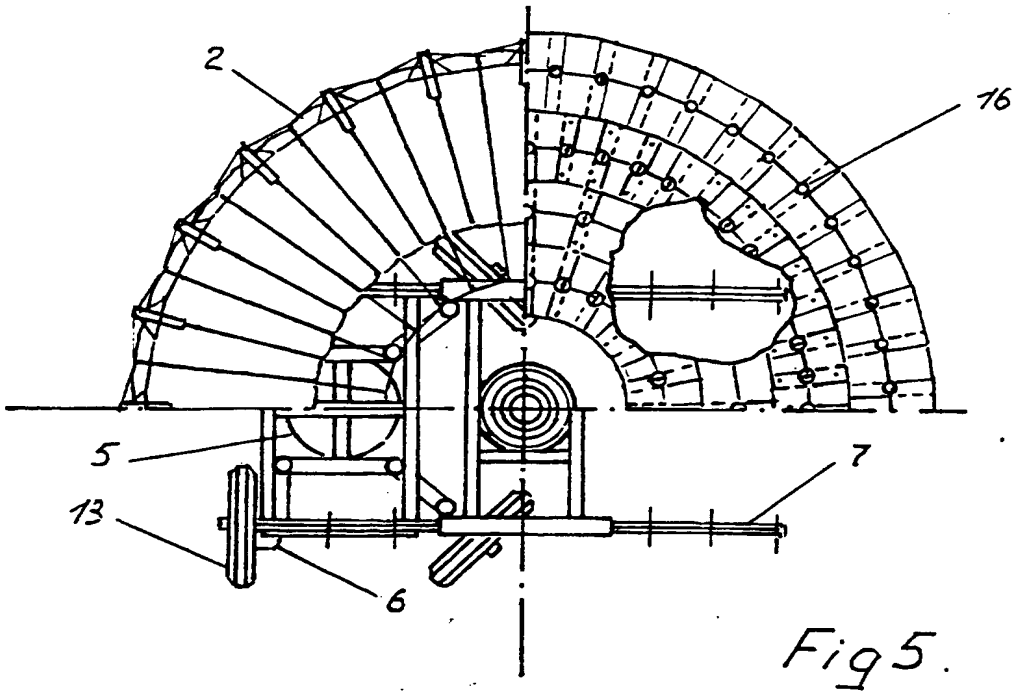

Fig 5.

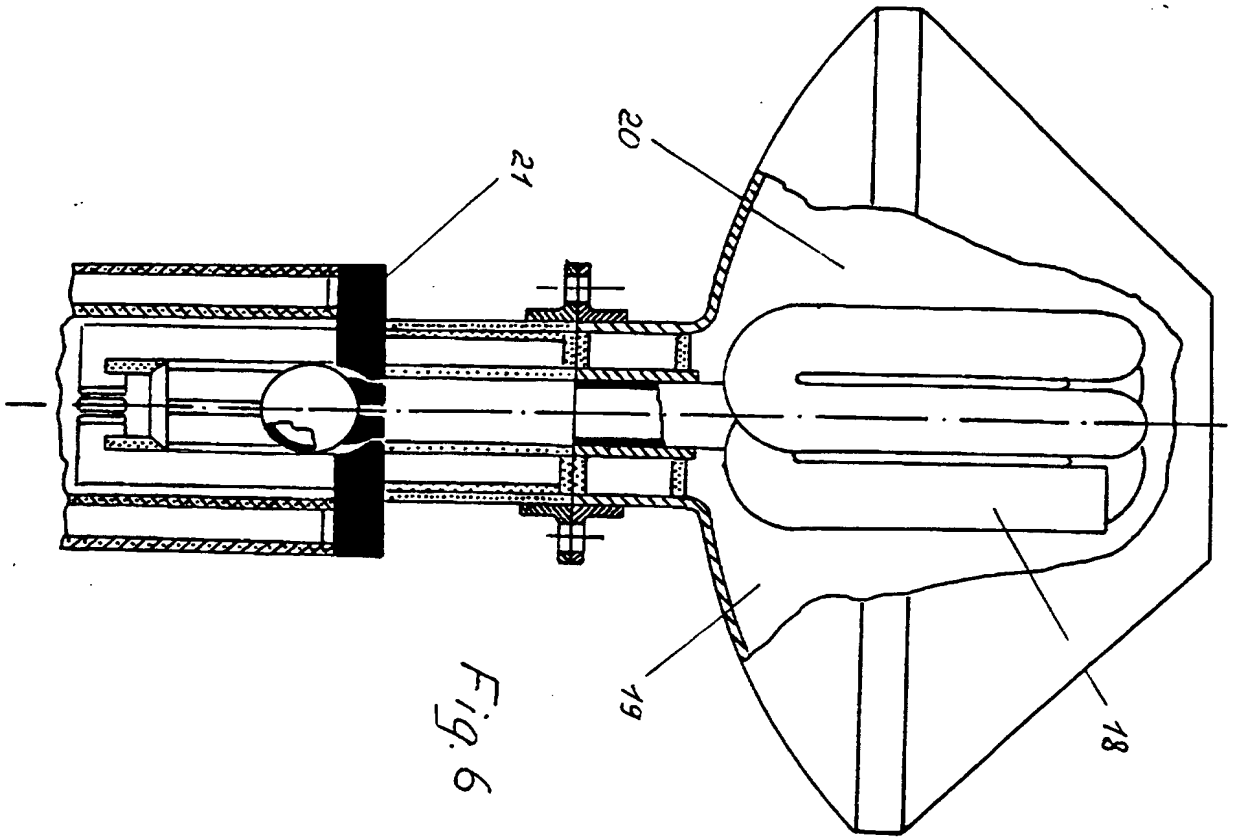

Fig. 6

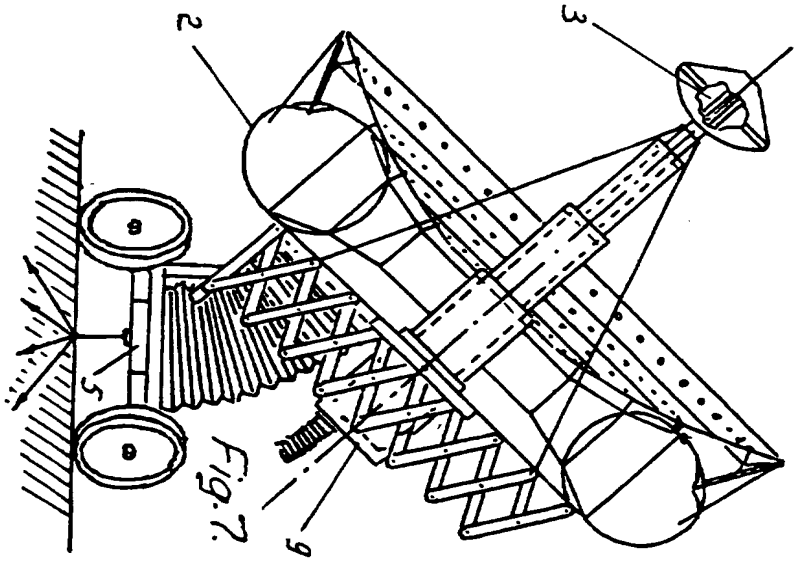

Fig. 2

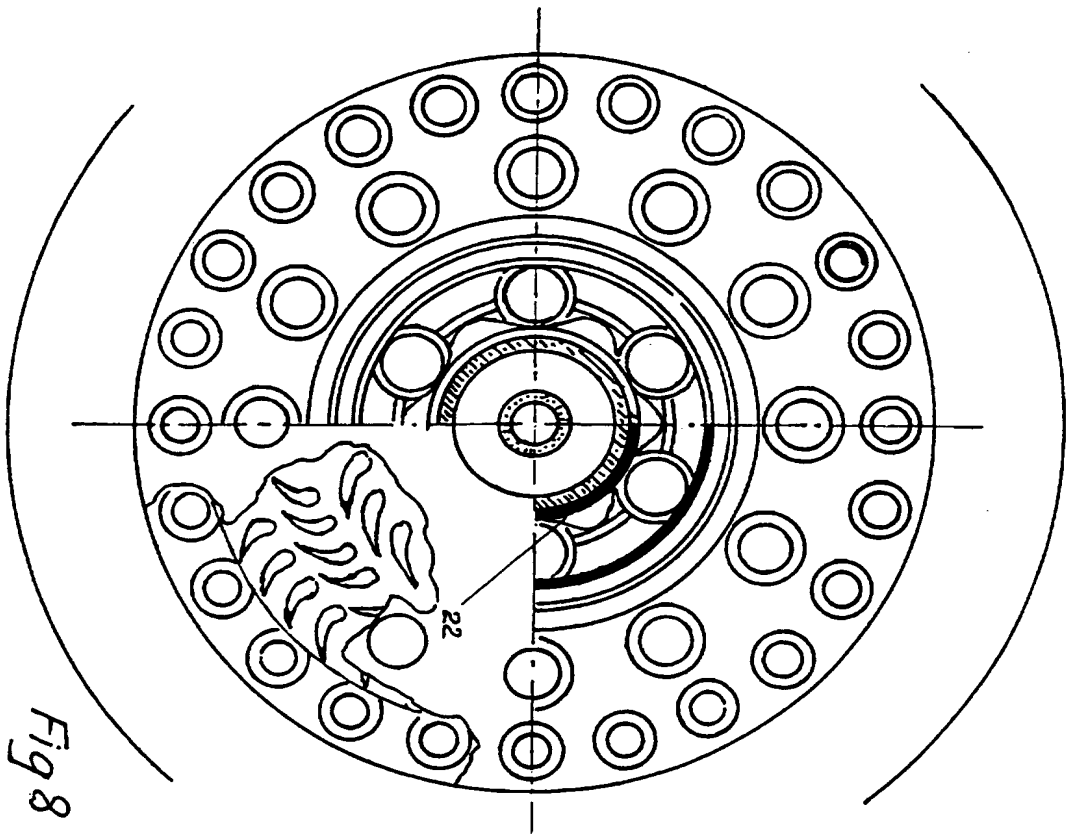

Fig 8

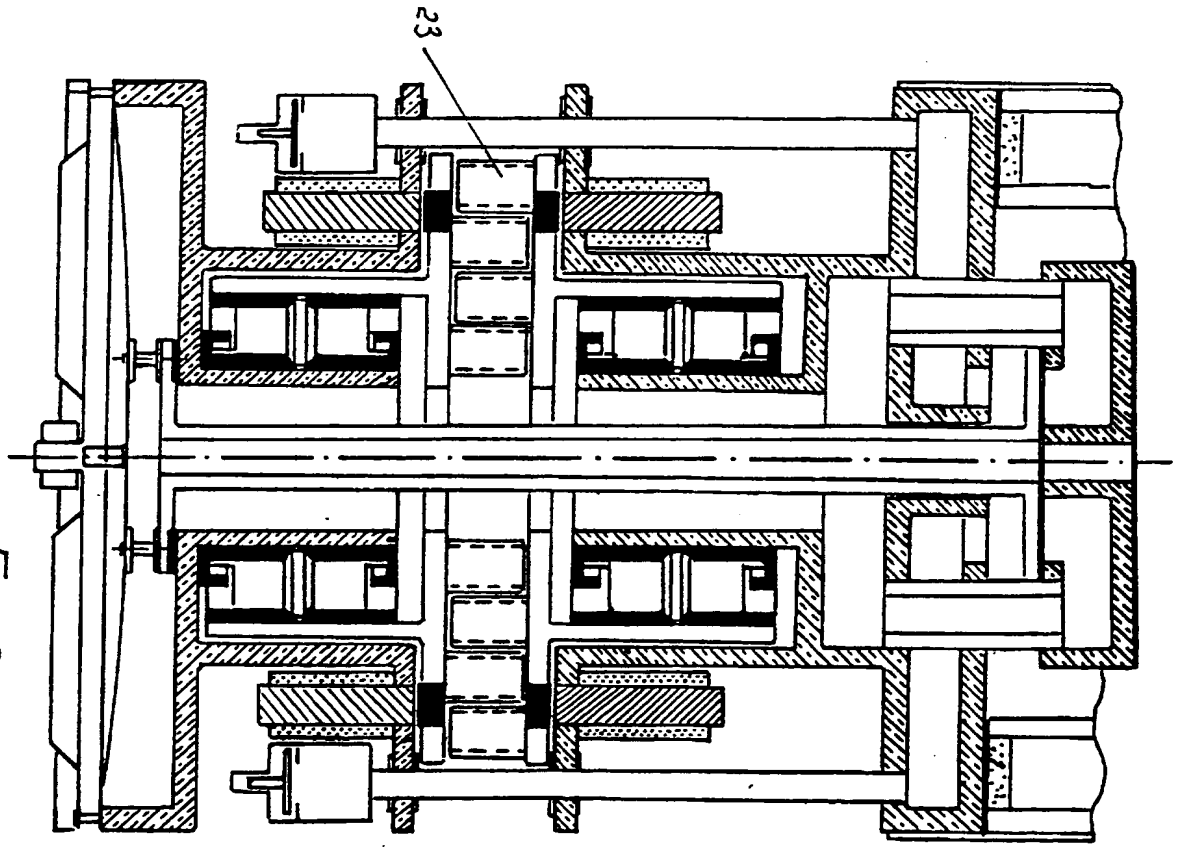

Fig. 9

2344189

INFLATABLE SOLAR MIRROR

The present invention relates to a inflatable mirror having a curved reflecting surface and a method of producing such a mirror.

In the past, curved, typically dished mirrors, have been formed of coated metal or glass or solid plastic or polished metal and the accurate curvature of such material is a complex and hence expensive operation. There are also practical limits particularly with regard to cost, and the problems of transporting large rigid objects to the size of which such mirrors can be constructed.
The present invention seeks to provide a mirror which over comes these disadvantages which is easy and cheap to produce and thus has much wider commercial application than the known types of dished and rigid mirrors.

According to the present invention there is provided a construction of mirror which contrary to well known types is not rigid but a inflatable and for that reason pliable, puch-absorbent one. Such qualiity of the present invention is a prerequisite for the production of extremely light and material-thrifty solar mirrors. There are known inflatable solar mirrors, which focussing reflecting surfaces are formed by two synthetic films, one of which has a metal coating. The films are located one opposite the other and are secured along their edges on a carrying elememt. The light passes through the first film in its path, and, being reflected from the metallized surface of the other film, concentrates in the latter's focus. To provide for the required curvature of the reflecting surface, gas under pressure is supplied into the cavity of inflatable body.
The drawback of such known inflatable mirrors is that the falling sun rays, when passing through the synthetic film, cause its ageing which results in blooming of the film, reduction of the efficiency of said mirrors and of its mechanical strength. In addition, the film placed in the area of high densety of solar energy is irradiated with sun ultraviolet rays. As a result of this irradiation, holes appear in the film, which violates the hermeticity of the cavity of the inflatable body and reduces its service life.
It is therefore a primary object of the present invention to provide an inflatable solar mirror, whose reflecting surface is exposed directly and hindrancefree to all spectrum of solar radiation on the other hand in which a complete protection of the rubbery casing of the inflatable supporting body against the sun ultraviolet

rays is ensured. According to the present invention there is provided a mirror, which comprising a plurality of the springy rings with a reflective, conical or rotation-parabolic surface which united with an inflatable body causes the rings to take up a shape so that rays impinging on the reflecting surface are reflected in a predetermined manner, whrein the manual demountability and remoutability of the rings is ensured by the winged nuts and the press-studs, which hold together the all plates of the rings and on the other hand does conect the rings with the said inflatable body. The materials of the rings and its components could be for example the metallicaly coated oxide ceramics or glass. In accordance with the thickness of said rings it would be possible the application of hard materials with a very limited elasticity.

It is another object of the present invention to provide a mirror, wherein the inflatable body possesses a torus affinitiv form and comprises a plurality of lapping tubes of elastic material and a coat of chain which cover the said plurality.

It is another object of the present invention to provide a mirror with an inflatable body in which links of the chain are the coiled strings whose relative lenght and relative force to which they are exposed is fixed as a result of a computer simulation for an optimal variant in a table N 1. how the genuine lenght 'Lg' and genuine force 'Fg' could be calculate from the formulas:
Lg = D*rl.lenght; Fg = D^2*(Ptube-Patm)*rl.force; wherein 'D' is the diameter of the mirror 'Ptube' is a pressure within the tube and 'Patm' is an atmospheric pressure.

It is another object of the present invention to provide an apparatus for utilising solar energy including a said mirror being mounted on a carrier so as to be pivotably relative thereto about a first axis substantially perpendicular to a normal axis of the mirror, the carrier being pivotable about a further axis substantially perpendicular to said first axis, so that said normal axis of the mirror can be aligned with the sun, and tracking means for pivotting the mirror about the first axis at a predetermined rate to track the sun through its daily arc; energy conversion means mounted on said carrier in a fixed position relative to the mirror so as to be at a focal point or line of the mirror so that the sun's rays can be focussed on said energy conversion means.

It is another object of the present invention to provide an apparatus wherein said energy conversion means are either a by hot air driven Ljungstromturbine which wheels are equiped with permanent magnets or the said energy conversion means are such as photovoltaic elements.

An embodiment of the invention will now be described by way of example with reference to the accompanying drawings in which:

Figure 1 is a general view of mirror in accordance with the present invention.

Figure 2 is a optimal variant of the computer design for the chain-coating of the inflatable body.

Figure 3 is a fraction of the tauted coat of the chain with all links, wherein its relative lenght and relative forse, to which the links are exposed, are presented in Tabelle N 1.

Figure 4 is a springy ring with its componets the winged nuts and the press-studs.

Figure 5 is a top view of plurality of the springy rings of the mirror.

Figure 6 is an pulsed airheater at the focussed spot.

Figure 7 is a side view of presented mirror.

Figure 8 and 9 is a turboengine with an electricity producer.

Referring firstly in Figure 1 there is shown a springy rings 1 which are attached to inflatable body 2.

Referring now to Figure 1. a mirror of the type just described is shown mounted on a divergent shearslike frame 7 with a cylindrical collapsible air heatting chamber 8 and a hot air driven turbine of Ljungstrom 9. The geometrical axis of the chamber coincides with optical axis of the said mirror. The precision of the coincidence of both axes is ensured by four ropes 10. The frame 7 is itself pivotally mounted on a car 11 by means of axis 12 and a servomotor 4 which is driven by pressured air from a membrane compressor 5. The car 11 with four adjustable wheels 13 and an anchoring 14 is able to rotate around an axes 15 which is perpendicular to earthsurface and to the swivelling axis 12. The wheels 13 are equiped with electric motors 6. The mirror is then arranged to be pivoted by the servomotor 4, compressor 5 and electric motors 6 to thereby track the sun through its daily arc. Equally an electronic drive, controlled by computer (as in modern telescopes) may be used to serve the same purposes. Thus the maximum amount of sunlight always falls on the mirror.

Tabelle N1.

pos.	link	set	rl.lenght	rl.force	pos.	link	set	rl.lenght	rl.force
1	a(f	24	0.08222	0.00829	14	l-n	24	0.13225	0.00109
2	a(b	24	0.07463	0.00829	15	q-p	24	0.09261	0.00153
3	b(c	24	0.17097	0.00829	16	q-q	48	0.04694	0.04361
4	c(d	24	0.17109	0.00829	17	f-j	48	0.23229	0.00700
5	d(e	24	0.01406	0.00829	18	h-g	48	0.05278	0.00600
6	e(f	24	0.17545	0.01401	19	h-j	48	0.06371	0.00724
7	o(k	24	0.38122	0.01401	20	h-i	24	0.06317	0.00718
8	m(n	24	0.07115	0.00829	21	i-h	24	0.06317	0.03248
9	n(o	24	0.10571	0.00829	22	d-r	24	0.07300	0.00572
10	m(l	24	0.07115	0.00829	23	r-r	24	0.08130	0.04380
11	l(k	24	0.10571	0.00829	24	b-d	24	0.21083	0.00255
12	k-l	24	0.09478	0.00627	25	a-g	24	0.06774	0.00484
13	l-q	24	0.10520	0.00580	26	g-j	24	0.07754	0.01147

CLAIMS

1. A mirror comprising a plurality of springy rings with the reflective, conical or rotation-parabolic surface which united with the inflatable body causes the rings to take up a shape so that rays impinging on the reflecting surface are reflected in a predetermined manner, whrein the manual demountability and remoutability of the rings is ensured by the winged nuts and the press-studs.

2. A mirror as claimed in claim 1 wherein the inflatable body possesses a torus-affinitiv form and comprises a plurality of lapping tubes of elastic material and a coat of chain which cover the said plurality.

3. A mirror as claimed in claim 2 wherein the links of the chain are the coiled strings whose relative lenght and relative force to which they are exposed is fixed as a result of a computer simulation for an optimal variant in a table N 1 how the genuine lenght 'Lg' and genuine force 'Fg' could be calculate from the formulas:

Lg = D*rl.lenght; Fg = D^2*(Ptube-Patm)*rl.force;

wherein D is the diameter of the mirror Ptube is a pressure within the tube and Patm is an atmospheric pressure.

4. Apparatus for utilising solar energy including a mirror as claimed in any one of the preceding claims, said mirror being mounted on a carrier so as to be pivotably relative thereto about a first axis substantially perpendicular to a normal axis of the mirror, the carrier being pivotable about a further axis substantially perpendicular to said first axis, so that said normal axis of the mirror can be aigened with the sun, and tracking means for pivotting the mirror about the first axis at a predetermined rate to track the sun through its daily arc; energy conversion means mounted on said carrier in a fixed position relative to the mirror so as to be at a focal point or line of the mirror so that the sun's rays can be focussed on said energy conversion means.

5. Apparatus as claimed in claim 4 wherein said energy conversion means are either a by hot air driven Ljungstromturbine which wheels are equiped with permanent magnets or are such as photovoltaic elemennts.

6. Apparatus including a mirror for harnessing solar energy substantially as described herein with reference to and as illustrated in the accompanying drawings.

The Patent Office

6

INVESTOR IN PEOPLE

Application No: GB 9825863.5
Claims searched: 1 - 6

Examiner: Andrew P Jenner
Date of search: 22 September 1999

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.Q): G2J: JMM, JMF

Int Cl (Ed.6): G02B, F24J

Other: World Patents Index, Epodoc, JAPIO

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	DE 19649988 A1 USTINOW	1 - 6
X	SU 1823040 A1 ZATONENKO	1

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.